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Thirty-First Annual Report

OF THE

Agricultural Experiment Station

OF THE

Alabama Polytechnic Institute

Auburn, Alabama

January, 1919

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ALABAMA POLYTECHNIC INSTITUTE

Auburn, Ala., Jan. 24, 1919.

Governor Thomas E. Kilby,
Executive Department,
Montgomery, Ala.

Sir:

I have the honor herewith to transmit to you the Thirty-first Annual Report of the Agricultural Experiment Station of the Alabama Polytechnic Institute.

This report is made in accordance with the Act of Congress approved March 2, 1887, establishing agricultural experiment stations, and the Act of Congress approved March 16, 1906, known as the Adams Act.

Respectfully,
CHAS. C. THACH,
President.

Auburn, Ala., Jan. 23, 1919.

Dr. C. C. Thach, President,
Alabama Polytechnic Institute,
Auburn, Ala.

Sir:

I herewith submit the Thirty-First Annual Report of the Experiment Station of the Alabama Polytechnic Institute for the fiscal year ending June 30, 1918.

It contains the detailed report of the Director, the Agriculturist, the Treasurer, the Chemist, the Veterinarian, the Botanist, the Horticulturist, the Entomologist, the Plant Pathologist, and the Animal Husbandman, for the year ending December 31, 1918.

Respectfully submitted,
J. F. DUGGAR,
Director, Experiment Station.

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STATION STAFF

C. C. THACH, President of the College

J. F. DUGGAR, Director of Experiment Station

AGRICULTURE:

J. F. Duggar, Agriculturist.
E. F. Cauthen, Agriculturist.
M. J. Funchess, Associate.
J. T. Williamson, Field Agt.
H. B. Tisdale, Associate Plant Breeder.
O. H. Sellers, Assistant.
M. H. Pearson, Assistant.

VETERINARY SCIENCE:

C. A. Cary, Veterinarian.

CHEMISTRY:

B. B. Ross, Chemist.
E. R. Miller, Chemist Soils and Crops.
C. L. Hare, Physiological Chemist.

BOTANY:

W. A. Gardner, Botanist.
Robert Stratton, Assistant.

PLANT PATHOLOGY:

G. L. Peltier, Plant Pathologist.

HORTICULTURE:

G. C. Starcher, Horticulturist.
J. C. C. Price, Associate.
L. A. Hawkins, Assistant.

ENTOMOLOGY:

W. E. Hinds, Entomologist.
F. L. Thomas, Assistant.
J. M. Robinson, Assistant.

ANIMAL HUSBANDRY:

G. S. Templeton, Animal Husbandman.
F. O. Montague, Assistant.
E. Gibbens, Assistant.
G. L. Burleson, Assistant.
F. W. Burns, Assistant.

EDITOR:

Leslie L. Gilbert.

REPORT OF HATCH AND ADAMS FUNDS FOR 1917-1918

Receipts.

	Hatch	Adams
To amount from U. S. Treasury (Net)	$15,000.00	$15,000.00
Disbursements		
By Salaries	$ 7,386.72	$ 8,742.15
By Labor	1,977.85	1,522.02
By Publications	2,181.46	
By Postage and Stationery	338.58	125.24
By Freight and Express	222.68	184.38
By Heat, Light, Water and Power	433.24	363.74
By Chemicals and Laboratory Supplies	9.93	1,452.48
By Seeds, Plants and Sundry Supplies	785.78	257.19
By Fertilizers	591.78	50.00
By Feeding Stuffs	89.70	532.40
By Library	255.45	135.62
By Tools, Machinery and Appliances	319.12	27.99
By Furniture and Fixtures	54.50	207.84
By Scientific Apparatus and Specimens	4.87	641.20
By Live Stock	18.62	
By Traveling Expenses	98.43	644.57
By Contingent Expenses	20.00	
By Buildings and Land	211.29	113.18
Total	$15,000.00	$15,000.00

Respectfully,

(Signed): M. A. GLENN,

Treasurer.

State of Alabama:

Lee County.

Personally appeared before me, B. L. Shi, a Notary Public in and for said county, M. A. Glenn, known to me as Treasurer of the Alabama Polytechnic Institute, who, being duly sworn, deposes and says the above foregoing account is true and correct. Witness my hand this 17th day of January, 1919.

B. L. SHI,

Notary Public, Lee County.

This is to certify that I have compared the account with the ledger account of the Treasurer, and this is a correct transcript of the same.

CHAS. C. THACH,

President Alabama Polytechnic Institute.

REPORT OF DIRECTOR

J. F. Duggar

Auburn, Ala., Jan. 22, 1919.

Dr. C. C. Thach, President,
Alabama Polytechnic Institute,
Auburn, Ala.

Sir:

I respectfully submit the following report for the past year of the work under my charge as Director of the Alabama Experiment Station:

PUBLICATIONS

The publications of the Alabama Experiment Station for the fiscal year ending June 30, 1918, consist of the annual report, eight bulletins, two circulars, and five press bulletins, making a total of sixteen publications. Below I give their titles and authors:

Bulletin No. 197: "Harvesting and Storing Sweet Potatoes;" by the Associate Horticulturist.

Bulletin No. 198: "Velvet Beans Compared with Cotton Seed Meal For Fattening Steers, etc.;" by the Animal Husbandman (From the Local Experiment Fund.)

Bulletin No. 199: "Report on Freeze Injury to Citrus Trees for 1916 and 1917, with Notes on Orange Culture in South Alabama;" by O. F. E. Winberg, Horticulturist and Field Agent. (From the Local Experiment Fund.)

Bulletin No. 200: "Tests of Varieties of Corn at Auburn;" by Agriculturist.

Bulletin No. 201: "The Development of Soluble Manganese in Acid Soils as Influenced by Certain Nitrogenous Fertilizers;" by Associate Agronomist.

Bulletin No. 202: "Growing Soy Beans in Alabama;" by the Agriculturist.

Bulletin No. 203: "Soy Beans in Alabama;" by the Agriculturist.

Bulletin No. 204: "The Destruction of Vanillin in the Soil by the Action of Soil Bacteria;" by the Botanist.

Circular No. 37: "Sweet Potato Root Borer;" by the Entomologist. (From the Local Experiment Fund.)

Circular No. 38: "Annual Report of the Director of the Experiment Station on Work Done Under the Local Experiment Law in 1917." (From the Local Experiment Fund.)

Press Bulletin No. 90: "How to Save Alabama's Corn Crop;" by the Entomologist.

Press Bulletin No. 91: "Tests of Varieties of Corn in 1917;" by the Agriculturist.

Press Bulletin No. 92: "Tests of Varieties of Cotton in 1917;" by the Agriculturist.

Press Bulletin No. 93: "Corn Insect Control Through Seed Selection and Trap Planting;" by the Entomologist. (From the Local Experiment Fund.)

Press Bulletin No. 94: "Fumigation Treatment to Save Corn and Peas;" by the Entomologist.

ADAPTING EXPERIMENT STATION WORK TO NATIONAL NEEDS

After America entered the war heads of departments of the Experiment Station were requested to give preference to those projects having an immediate bearing on the increase of the nation's food supplies. An examination of the projects then in hand showed that so many of them already had this direct application to food production problems that relatively little change in the entire plan of work was made necessary by the national emergency.

MAIN LINES OF WORK IN VARIOUS DEPARTMENTS

The attached reports of heads of departments afford statements of the lines of work in progress in the Alabama Experiment Station. It is in place here to allude briefly to only a few of these, and only to results at the main Station, reserving for a later report a statement regarding the experiments conducted under the Local Experiment Law in the various counties of the state.

Plant Breeding—On the Experiment Station farm at Auburn during the past year, as for a number of years, a large amount of attention has been given to the breeding up of new strains or varieties of cotton, corn, and oats. In addition the breeding of wheat, peanuts, and some other plants is in progress.

Cotton—So favorably have the varieties bred up at Auburn proved their worth in farmers' hands that where they are being tested by farmers with reference to their local adaptation the seed have been in great demand in the immediate neighborhood. This has been especially true of certain strains of Cook cotton, several of which have shown notable superiority to standard varieties in yield of lint per acre, and in percentage of lint.

As an example of the estimate placed on some of these bred-up strains by farmers is a statement from a farmer in Dallas County, who after producing the past year on 5 acres 4860 pounds of seed cotton from one of these bred-up strains of Cook cotton seed, reported that his crop made an out-turn of 40.8 per cent of lint and yielded 25 per cent more lint per acre than the remainder of his crop planted in an ordinary variety.

Another strain of Cook evolved here in this process of plant breeding has developed the valuable quality of wilt resistance, together with high productiveness.

Oats—A cross or hybrid made at Auburn between two standard varieties of oats has thus far shown great promise in withstanding better than its Red Rust proof parent the severe freezes of the last two winters.

In the long continued experiment to determine the effects as regards resistance to winter killing of sowing seed oats of which the ancestors for a number of generations had become accustomed to fall sowing, as compared with the planting at the same time in the fall of seed oats most of whose progenitors had been sown in the spring, we have now reached conclusive proof of the superior hardiness of the fall sown strain. The practical point of this lies in the fact that it emphasizes the superiorty for seed purposes of home grown oats of known cultural history as compared with Texas or Oklahoma oats descended from a strain sown there after Christmas.

Soy Beans—The results of experiments made through a number of years with soy beans have recently been published, and the two bulletins on this subject constitute a guide for the growing of this crop so promising of development, especially in central and north Alabama, both as a feed for hogs and as one of the plans promising to assist in the further development of the oil industry of the state.

Fertilizer Tests—The work with fertilizers on the Experifent Station farm has been largely directed to determining the relative values of peanut meal and velvet bean meal in comparison with the fertilizing value of cotton seed meal and nitrate of soda. The results of the last year's tests will be made known at once through the press, so as to help farmers in their purchases of fertilizer in the present winter and approaching spring.

Investigation of soils—Painstaking investigations of the soil expert have indicated the great decrease in crop yield due to soil acidity, and have indicated that the application of various fertilizers has a notable effect in increasing this acidity and therefore in increasing the need for the use of lime.

Sweet Potato Storage—Both the departments of horticulture and botany are pursuing investigations to reduce the losses of sweet potatoes during winter storage.

Plant Diseases—The Plant Pathologist in his study of the life history of the organism causing the disease citrus canker, which at one time threatened to destroy the entire Satsuma orange industry of the southern part of the state, has brought to light important facts which are being utilized in the successful warfare now being waged for the extermination of this disease.

Insect Pests—The Entomologist has brought to play, in reducing the insect injury to stored corn, the results of his successful study of the life history of the weevil responsible for this damage. The methods of reducing the injury to corn by this weevil found most practicable are the planting of seed corn from ears having tips well covered and protected by tight fitting shucks, and the early planting near the cribs, (where the weevils spend the winter), of small patches of early corn to serve as traps for the weevil. By the feeding of this early corn before it is throughly matured most of the weevils are destroyed and their propagation on the main crop prevented.

Feeding Experiments with Hogs—The Animal Husbandry department has obtained important results in showing the effects of peanuts, peanut meal and other feeds on the quality of pork and lard. The feeding of velvet beans variously prepared is being continued, and chemical work has in recent months

been begun of the entire velvet bean plant, including an examination to determine whether it contains any toxic substances that may be responsible for the unfavorable results sometimes reported with pregnant sows.

CHANGES IN STAFF

During the year covered changes occurred in the headship of two departments. The Agricultural Engineer, Professor R. U. Blasingame, resigned to accept a corresponding position with the Agricultural College of Pennsylvania; and Dr. Wright A. Gardner was appointed Botanist in September, 1917, in succession to Dr. W. J. Robbins, who resigned to engage in a business enterprise. There has been a number of changes among assistants.

For further details the reports of the several heads of departments should be consulted.

Respectfully submitted,

J. F. DUGGAR,

Director.

REPORT OF AGRICULTURIST
(Work under Hatch and Adams Funds)

E. F. CAUTHEN

Cotton—Cotton breeding received a great deal of attention along the lines pursued in previous years. Cleveland and Cook varieties and also a hybrid (King and Triumph) were grown in plant-to-row tests and considerable data were taken on type of plants, size of bolls, length of fiber, earliness, resistance to disease, etc., for use in the study of correlation. While making a careful study of these varieties, as a plant breeding project, some very desirable strains of Cook and Cleveland have been isolated, and their seed placed among farmers for multiplication.

Five cotton hybrids, including Cook Unknown, and Cook Trice were planted in isolated places and studied. A hybrid of a short staple variety crossed on Yuma (a long staple Egyptian cotton) was studied with a view to determining the dominant and recessive characters.

The variety tests included a comparison of 22 leading short staple varieties in regular plots, 17 less well known varieties for observation, and 9 varieties in a long staple test. The experiment comparing light and heavy seed was continued. A test of the effects of topping at different ages on earliness and yield was made; also the effects of thinning early and late, planting the seed on a bed, on a level, and in a water furrow.

Corn—Considerable attention was given by Mr. Tisdale to the project in corn breeding. The work of correlating the different ear characters is being continued with two prolific varieties; Experiment Station Yellow, a yellow flint variety, and Whatley, a white dent weevil-resistant variety. The characters of the ear and shuck that fit it for weevil resistance are being correlated with yield and other characters. The ear-to-row method is used on the two varieties in testing the characters that give a high correlation and in selecting for strains of corn best suited to Alabama conditions.

Eighteen varieties of corn were tested in plots for compara-

tive yield and 12 less well known varieties were grown in rows for observation. A test of varieties for late planting included Goliad, Dwarf Mexican June, Lowman Yellow and Experiment Station Yellow. The test of the Williamson method of planting corn was continued.

Oats—The regular fall planted variety test of oats included most of the promising southern varieties. The severe freeze of the winter of 1917 and 1918 showed that Culberson was the most resistant to winter killing of the "rust proof" group. Among the hybrids No. 651, a cross made at Auburn of Culberson on Red Rust Proof withstood the freezes of both preceding winters.

The Red Rust Proof and Fulghum varieties were planted in plant-to-row tests for study and from them some promising strains have been isolated. Forty to fifty bushels of pedigreed seed have been placed with selected farmers for further testing and multiplication. When bearded and beardless kernels are separated from the same head and planted, their progeny show on the same plant both bearded and beardless kernels in about the same proportion as on the parent plant.

The test of fall versus spring planting of oats continued to show from 20 to 40 per cent increase in yield in favor of the fall planting. In the spring planted variety tests Burt, Fulghum and Dixie produced the largest yields of grain. In seeding oats after cotton on sandy upland the plowing of the land as a preparation has not increased the yield.

Wheat—In the regular variety tests of wheat were included both those varieties that have been grown here many years and those that have not yet become well established. Among those that are well established is the Alabama Blue Stem, a local variety that deserves special mention because it has been found to do well in many parts of the state. The breeding of the Alabama Blue Stem by the plant-to-row method has given several strains, some of which seem to be more resistant to leaf rust than others. The experiment in rate of seeding wheat seemed to bear out the common practice of seeding about 60 pounds per acre. February planting of wheat gave low yields.

Barley—The work with barley included a variety test plant-

ed in the fall and one planted in February. In the February planting the hooded and beardless varieties yielded well and these seem to offer special promise for early spring planted grain and feed.

Rye—The principal work with rye for 1918 was a regular variety test, which showed that a native variety from Tuscaloosa county was equal to Abruzzi in yield and seemed more resistant to anthracnose.

Soy Beans—The experiments with soy beans included rate of seeding both for hay and for seed; regular variety tests for both seed and for hay; a fertilizer test, which seemed to indicate very little advantage from any particular kind of fertilizer; and harvesting and thrashing of soy beans. A test of soy beans, cowpeas, corn, and velvet beans was made to get the comparative yield of grain of each crop.

Commercial Fertilizer—The experiments testing the time when nitrate of soda should be applied to corn and cotton to secure the greatest benefits were repeated. Peanut meal, velvet bean meal, and cotton seed meal were compared with nitrate of soda as a source of nitrogen for corn and cotton, and gave results strongly favorable to nitrate of soda. The comparison of acid phosphate with fine ground rock phosphate under oats and soy beans, corn and cotton was continued. Potash from different sources (cement potash, kelp ash, kainit, sulphate, and Nebraska potash) was tested under cotton to compare their availability.

In addition to the above mentioned experiments, the following were conducted on the Alabama Experiment Station farm in 1918:

Grasses, test of species and varieties.

Hog crops, relative yields from chufas, peanuts, soy beans, etc.

Kudzu.

Phosphates, raw versus acid.

Peanuts, variety tests, fertilizer tests.

Rotation experiments.

Rate of seeding peanuts.

Residual effect of different crops on soil fertility.

Sorghum, tests of varieties for forage and for syrup.

Subsoiling.
Sudan grass for hay and its mixtures with cowpeas.
Sugar cane, Japanese as a forage crop.
Tangier peas for seed.
Velvet beans, varieties for seed and from different sources.
Vetches, varieties.
Vetches, best mixtures.

Respectfully submitted,

E. F. CAUTHEN,

Agriculturist.

REPORT OF AGRONOMIST

M. J. Funchess

Auburn, Ala., Jan. 10, 1919.

Director J. F. Duggar,
Auburn, Ala.

Sir:

I beg to submit the following brief report of the work done during the past year.

A study of the lasting effect of certain organic toxins was continued, with results very similar to those obtained in previous years. There is no indication of lasting toxicity of organic toxins applied to soils. Immediately after their application, a marked toxicity may be caused by certain compounds. In time, this toxicity disappears and normal plant growth is sustained.

Work on the development of soluble manganese in acid soils was continued, using ten soils of widely differing characteristics. The application of dried blood produced more soluble manganese in each of the acid soils; and small amounts of aluminum were also found in a few of these. Recent work seems to indicate, however, that actual acidity rather than soluble manganese may be responsible for a part of the toxicity found in soils fertilized with dried blood.

Manganese nitrate added to the soils used in this study proved to be toxic when used at the rate of 100 parts of manganese per million parts of soil, and at all higher rates. Plants were killed in most soils when the rate was 300 parts per million. In limestone soils well supplied with calcium carbonate, manganese used at the above rates caused little or no injury.

By means of experiments now under way, it is hoped that the relative importance of acidity and of salts in solution as the cause of toxicity, may be established.

Respectfully submitted,

M. J. FUNCHESS,

Agronomist.

REPORT OF BOTANIST

WRIGHT A. GARDNER

Auburn, Ala., Jan. 18, 1919.

Director J. F. Duggar,
Alabama Experiment Station,
Auburn, Ala.

Sir:

I beg leave to submit the following report of experimental work conducted by the Department of Botany during the past year.

Adams Fund Projects.

(1) Soil Toxin Project. Various claims have been made with reference to the presence of poisonous substances in soils. Some claim that poisonous substances are excreted by the roots; others claim that they are products of the decomposition of plant and animal tissue. The majority of those interested in soil fertility investigations admit the presence of these poisonous substances whether they consider them important or not. The workers in the Bureau of Soils in Washington have separated from soils several substances poisonous to crop plants, such as wheat, corn and peas. The workers in this laboratory have been seeking agencies and conditions for the destruction of these injurious substances. W. J. Robbins, in Bulletin 204, The Destruction of Vanillin in the Soil by the Action of Bacteria, June, 1918, shows that certain bacteria decompose vanillin and points out several conditions favorable to its decomposition. Two lines of investigation are now being carried on. One deals with the relation of oxygen and water to the decomposition of vanillin in the soils. Results so far obtained indicate that under soil conditions an inadequate water supply is more frequently the limiting factor. The other investigation deals with the decomposition of toxins by soil bacteria. Results obtained indicate that many soils from Alabama and elsewhere, though not all, contain organisms which decompose cinnamic acid, resorcin, and vanillin, that some soils contain organisms which decompose guanidine hydrochloride, piperidine, and cumarin,

and that a few soils contain organisms which decompose benzidine, caffein, pyridine and quinoline. No soils examined contain organisms which decompose hydrochinone salicylic aldehyde, or oxalic acid.

(2) Sweet Potato Project. In view of the loss of sweet potatoes during the winter of 1917-18 on account of chilling it seemed desirable to make a study of the changes undergone by sweet potatoes during storage under various controlled conditions. Investigations of the changes in cell walls and cell contents of sweet potatoes stored under various conditions and subjected to change of temperature are already under way. An attempt will be made to show which processes and conditions are responsible for the injury due to chilling and what agencies actually cause the injury.

Hatch Fund Projects.

No projects have been definitely outlined under the Hatch Fund. Some work has been done on each of the following:

(1) The effect of certain factors in the digestion of cellulose by Penicillium species.

(2) Manganese poisoning of plants.

The experiment station projects in the Botany Department are:

(1) Soil toxin project, Adams Fund.

(2) Sweet Potato project, Adams Fund.

(3) Miscellaneous botanical investigations, Hatch Fund.

Respectfully submitted,

WRIGHT A. GARDNER,

Botanist.

REPORT OF PLANT PATHOLOGIST

G. L. PELTIER

Auburn, Ala., Dec. 16, 1918.

Prof. J. F. Duggar, Director,
Agricultural Experiment Station.
Auburn, Ala.

Sir:

I am herewith submitting a brief statement of the work now in progress in the Department of Plant Pathology.

(1) Under the Adams fund the citrus-canker project has been continued, the results obtained being embodied in the following papers:

Susceptibility and resistance to citrus canker of the wild relatives, citrus fruits, and hybrids of the genus citrus. (Preliminary paper) Journal of Agricultural Research XIV, No. 9, 337-357 (Aug.) 1918, pls. 50-53.

Overwintering of the citrus canker organisms in the outer bark tissues of the hardy citrus hybrids. (with D. C. Neal.) Journal of Agricultural Research XIV, No. 11, 523-524. (Sept.) 1918, pl. 58.

A convenient heating and sterilizing outfit for a field laboratory. (With D. C. Neal.) Phytopathology VIII, No. 8, 436-438. (Aug.) 1918, 2 figs.

Susceptibility and resistance to citrus canker of the wild relatives, citrus fruits, and hybrids, of the genus citrus. (Progress report.) In preparation.

Several promising fruits and plants suitable for stock which may be successfully grown in South Alabama have been found to be quite resistant to citrus canker. Observations during the winter of 1917-1918 have shown that the canker organism can, after gaining entrance into the bark tissues, remain dormant (6 months) through the winter and break out in a virulent stage when conditions are favorable for its development.

Some progress has been made on a method for isolating the canker organism from the soil, while the same may be said of a number of experiments associated with the life-history of the organism.

On November 11, 1918, the writer was granted a four months leave, to study the influence of temperature and humidity on the development of the citrus canker organism and the disease caused by it, in the botanical laboratories and green houses of the University of Illinois.

(2) Some of the Local Experiment Fund has been used to maintain the field laboratory at Loxley, Alabama. Besides a study of citrus canker, observations have been made on the plant diseases peculiar to South Alabama and the farmer advised in preventive and control measures.

No definite projects have been started but the work under the Local Experiment Fund this past year has been confined to observations of a number of troublesome plant diseases, some of which are new or little known in Alabama.

Respectfully submitted,

GEORGE L. PELTIER,

Plant Pathologist.

REPORT OF HOHTICULTURIST

G. C. Starcher

Auburn, Ala., Jan. 15, 1919.

Prof. J. F. Duggar,
Director of Experiment Station,
Auburn, Ala.

Sir:

In response to your request, I herewith submit a report on the progress of the work in this Department.

Pecans—We have continued our notes on the variety pecan orchard.

Peaches—We continued our notes on varieties of peaches. Some new varieties originated here are being propagated. We also continued our notes on spraying of peaches with different materials.

Pears—We have continued our notes on varieties of pears, with especial reference to susceptibility to blight. We added to the variety planting for this purpose.

Strawberries—We made a variety planting of twenty-nine varieties.

Raspberries—We made a variety planting of five red raspberries and five black cap raspberries.

Blackberries—We planted five varieties of blackberries, the Lucretia dewberry and the Loganberry.

Sweet Potatoes—We have started a new series of sweet potato storage experiments to determine the influence of time of digging, i. e.., before and after the vines were frosted, and the influence of temperature and ventilation on the keeping of the potatoes. For carrying out these experiments we have remodeled the storage house formerly used. We now have three rooms, one large room heated by a coal stove and one small room heated by an oil stove. Neither of these rooms has a dead air space in the floor or ceiling. A third room, heated by an oil stove, has a dead air space in the walls, ceiling and floor. Careful thermo-hygrograph records are being kept in all the rooms.

The experiments in the house are being correlated with

storage experiments in hills.

Tomatoes—Variety experiments were started to note comparative wilt resistance of various varieties of tomatoes.

Melons—Our notes were continued on the yield, quality and keeping qualities of watermelons and muskmelons.

It will be practically impossible to do any new work with horticultural plants because we have little or no soil uniform enough for either variety tests or fertilizer work. Much of the soil which we have is so infected with nematode and disease, due to long use, that many plants cannot be grown at all.

The Department can do no work of importance until our funds are increased and suitable land secured.

Respectfully yours.

G. C. STARCHER,

Horticulturist.

REPORT OF ENTOMOLOGIST

W. E. Hinds

Auburn, Ala., Dec. 28, 1918.

Prof. J. F. Duggar,
Auburn, Ala.

Sir:

I submit below a report of the entomological work done during the past year under Adams and Hatch Funds.

Adams Fund Projects—1, Rice Weevil.

This project has been continued principally in the field. The practicability of utilizing "trap plots" for concentrating the first generation of *Calandra* and other species so that they may be removed while still in the grain and disposed of in such a manner as to prevent their spread to later maturing corn has been further tested and with satisfactory results. The field study of weevil resistance as shown by various varieties of corn has been continued. Whatley's Prolific still continues to lead in the desired combination of high yield and soundness of grain due to exceptionally good shuck covering. Owing to the great increase in yield in the crop of 1917 and also to the exceptionally cold winter the insect damage to the stored crop of that season was very much less than average through the State.

2. Arsenate of Lead—Work in this project was resumed using cotton and the boll weevil as experimental subjects. Some eighteen plots located mainly in the southeastern corner of the State where the heaviest infestation was expected, were dusted at various stages of the cotton and for a varying number of applications. The outdoor work was correlated with indoor cage experiments and chemical analyses of all materials used are being made by the Research Chemist. The field which showed the largest increase in yield, apparently due to the treatment, is being given a very close, detailed study. As a whole the results do not yet justify the recommendation of Arsenate of Lead or any other poisons dusting for boll weevil control.

3. Fumigation—Under this project we have entered a new phase of the work in the treatment of soils for the destruction

of various insects, such as white grubs, termites, woolly aphis, etc., and also for nematode worm control. The results thus far have shown that Sodium Cyanide may be used in solution at the rate of one (1) oz. in eight (8) gallons of water and at this strength it did not injure the foliage of any one of the numerous plants tested. When soil was saturated with this solution at such a rate that one (1) oz. of the Sodium Cyanide was applied to 10 to 12.5 square feet of area we obtained very satisfactory results in the practically complete control of white grubs, earthworms, termites, sow bugs and nematodes. It appears now that we have found a very fairly effective, economical and practicable method of fighting some of the soil infesting animals which have been very troublesome and almost impossible of control in the past. This is an extremely important field of study and will be continued. Even at present high prices for chemicals, the cost of treatment will not be over about $70.00 per acre. Furthermore, the work thus far has shown an extremely gratifying stimulation in the growth of all plants tested on the cyanide treated areas, which indicates that the treatment has a very important fertilizing, as well as a pest controlling value.

In the fumigation of Satsuma orange trees for the control of scale insects, white fly, etc., we have secured very satisfactory results so far as the control of these pests is concerned, but the cost of tents, chemicals, etc., has been so high under war conditions and the danger of spreading citrus canker is so great in some sections that this treatment is not likely to supersede spraying for some time yet.

Carbon disulphid fumigation for the destruction of the sweet potato root borer has not given satisfactory results when used in the sweet potato storage banks. It fails to kill all stages of the insect and evidently increases the rotting of the potatoes.

Other Projects:

Inspection work, carried on by the U. S. Bureau of Entomology agents in co-operation with this Department and with the Alabama State Board of Horticulture, has failed to reveal the presence of the sweet potato root borer at any other locality in Alabama than around Grand Bay in Mobile County. A determined effort is being made to exterminate this weevil this

season. Fortunately only seven or eight premises have been found infested and in all cases destruction of the crop has been secured under the tactful supervision of Dr. O. F. E. Winberg who has kindly served as field director of this work.

Respectfully submitted,

W. E. HINDS,

Entomologist.

REPORT OF ANIMAL HUSBANDMAN

GEO. S. TEMPLETON

Auburn, Ala., Jan. 14, 1919.

Prof. J. F. Duggar, Director,
Alabama Experiment Station,
Auburn, Ala.

Sir:

I respectfully submit the following report of the experimental work conducted by the Animal Husbandry Department during the past fiscal year. The experiments conducted at Auburn were supported by the Hatch and Adams funds appropriated by Congress. The experiments conducted in Marengo, Mobile and Bullock counties were supported by the State appropriation provided by the Local Experiment Law.

A study of the influence of some southern feeds upon the properties (melting point, keeping qualities, iodine value, and color) of lards was conducted in co-operation with the Department of Chemistry. Six lots of hogs, eight hogs to the lot, were fed the following ration:

Lot 1—Corn, 8 parts, tankage, 1 part.

Lot 2—Corn, 1 part, peanut meal, 1 part.

Lot 3—Corn, 2 parts, peanut meal, 1 part.

Lot 4—Corn, 3 parts, peanut meal, 1 part.

Lot 5—Corn, 4 parts, velvet bean and pod meal, 4 parts, tankage, 1 part.

Lot 6—Corn, 1½ parts, velvet bean and pod meal, 1½ parts, peanut meal, 1 part.

The ration for Lot 5 proved to be unpalatable, and after it was continued nineteen days it was thought impracticable to continue the ration so the feed for this lot was changed to corn, 8 parts, and peanut meal, 1 part. The six lots were fed for a period of 104 days, when they were sufficiently finished for marketing. The hogs were marketed at the Birmingham Packing Company in Birmingham, Alabama. Cold storage notes were made on the carcasses, and samples of kidney fat from each individual in all the lots were given to the Chemistry Department for laboratory work. The Chem-

istry Department will make a report on the analyses.

The carcasses in Lot 1, corn and tankage, were entirely satisfactory to the packer. They were nicely finished and of excellent quality. Lots 2, 3, and 4, receiving varying amounts of peanut meal with corn, were classified by the packer as medium soft, and docked on this basis. The ration containing velvet bean and pod meal did not prove to be as palatable as the rations in Lots 1, 2, 3, and 4; consequently Lots 5 and 6 ate a much smaller amount of feed and made relatively smaller gains, and were not as nicely finished as those in the first four lots. The corn and peanut meal rations were very palatable and the hogs made uniformly good gains on these mixtures.

The average melting points for the lots were as follows:

Lot 1—44.15 degrees C.
Lot 2—40.35 degrees C.
Lot 3—42.2 degrees C.
Lot 4—40.57 degrees C.
Lot 6—42.5 degrees C.

During the year a test was started to determine the best and most economical method of preparing velvet beans in the pod as feed for dairy cattle. Three lots of four cows each were fed as follows:

Lot 1—Velvet beans in the pod (ground.)
Lot 2—Velvet beans in the pod (soaked.)
Lot 3—Velvet beans in the pod (dry.)

This work has not yet continued long enough for definite conclusions to be drawn.

Respectfully submitted,
GEO. S. TEMPLETON,
Animal Husbandman.

REPORT OF VETERINARIAN

C. A. Cary

Auburn, Ala., Jan. 9, 1919.

Director J. F. Duggar,
Auburn, Ala.

Sir:

During 1918 the following work was done.

(1) An attempt was made to ascertain the toxic effects of red buckeye (Aesculus pavia) when ingested by pigs.

One pig was given one half ounce of leaves, gathered in the fall, twice daily in feed for five days, then one ounce of buckeye leaves twice daily for five days and then given one and one half ounces twice daily for five days.

Another pig was given the ground bark and roots, the same amount, same dosage and for the same periods of five days each. The feed given each pig was two parts of velvet bean meal and one part of shorts.

Each one of these two pigs in 15 days gained eleven pounds in weight; the daily temperature of each was normal. Blood counts, made before and after the tests were finished, gave no distinct changes in red blood cells or in leucocytes. These two pigs remained in good health and maintained a good appetite.

A control pig was fed the same ration of velvet bean meal and shorts and gained ten pounds in the 15 days. The condition of this pig was practically the same as the two pigs eating the buckeye leaves and bark roots.

One pig was given freshly chopped buckeye nuts, gathered in fall, in green condition, in same doses twice daily in velvet bean meal and shorts for the same periods. The pig ate very little of the feed containing the nuts and lost four pounds during the fifteen days. Toward the end of the test this pig was dull, sluggish, inactive and had an unsteady gait. (This test should have been continued or repeated on one or more pigs and some means obtained to cover up the taste of the chopped nuts.) The result is doubtful but suggestive of some toxic effects.

In the Spring of 1918 the following tests were made.

Pig No. 343, weight 48 pounds, was given twice daily in peanut meal and bran one and one half ounces of ground green (spring) buckeye leaves, flowers and young stems. Excretions, temperature and general condition of this pig remained normal. Blood counts were also normal.

Pigs Nos. 344 and 345 were given every afternoon for four days an armful of young tender green buckeye. They ate a small amount of it. In the morning they were fed peanut meal and bran. Temperature remained normal: appetite good with no signs of diarrhoea or constipation. Blood counts remained normal. (These tests were made by senior veterinary medical students A. R. Gissendanner and B. W. Murray under my direction.) Tests will be made on hogs and cattle during 1919.

(2) In 1917 tests were made to determine the physiological or toxic action of Helenium tenuifolium on horses and dogs.

The results shown (after giving large quantities of the plant to horses) were that it produced distinct drowsiness, slow and weak pulse, slow and deep breathing; slight contraction of the pupil; subnormal temperature; always laxative and sometimes purgative action of the intestines.

On the dog similar action with some nausea and irration of the stomch.

In 1918, an active principle was extracted from the plant with ether, alcohol and hot water, which produced on horses, cattle and dogs subnormal temperature, slow pulse, slow respirations; laxative action and sometimes diarrhoea. Etherial solutions, made from alcoholic extracts, were tested for antipyrine, acetanilid and caffein—and all were negative. Alkaline etherial solutions were tested for brucine, strychnine, veratrine and cocaine with negative results. Inhalations from floating dust, while grinding dry plants, produced violent sneezing and headache. From these tests and clinical observation of horses and cattle that graze in pastures where this plant grows profusely it appears that there are instances or occasions when horses and mules and cattle eat sufficient to produce a type of forage poisoning that not infrequently

has fatal results. This occurs most commonly in the dry times of summer and fall when pastures are short and water is scarce.

(3) Some tests were made on the efficiency of anthelmintics on chickens. The results showed that :

(1) Santonin was quite ineffective on the intestinal parasites of chickens.

(2) Oil of chenopodium (alone or combined with chloroform) was somewhat effective for killing and removing *Taenia annulatum* from the intestines of chickens.

(3) Oil of turpentine proved to be the most effective for removing the *Taenia annulatum.*

The Farmers' Summer School was held at Auburn July 29th to August 4th, inclusive. There were three hundred and twenty-six farmers in attendance and a majority of the counties of the State were represented. Extraordinary interest was taken in all the lectures, exhibits and demonstrations with tractors, judging all kinds of live stock, etc.

Respectfully submitted,

C. A. CARY,

Veterinarian.

REPORT OF RESEARCH CHEMIST

EMERSON R. MILLER

Auburn, Ala., Dec. 28, 1918.

Prof. J. F. Duggar, Director,
Alabama Agricultural Experiment Station,
Auburn, Ala.

Sir:

Under the Adams fund the writer is engaged in a chemical investigation of the velvet bean, the object being to determine its composition with reference to mineral constitutents, fats, carbohydrates, proteins and enzymes. The purpose at present is, also, to study different parts of the plant in the same manner.

The writer will also endeavor to complete the work on the chemical analysis of arsenate of lead, upon which Dr. Anderson had done considerable work, as an Adams Fund Project, in co-operation with the Department of Entomology.

Respectfully submitted,

EMERSON R. MILLER,
Research Chemist.

REPORT OF PHYSIOLOGICAL CHEMIST

C. L. HARE

Auburn, Ala., Dec. 28, 1918.

Prof. J. F. Duggar, Director,
Alabama Experiment Station,
Auburn, Ala.

Sir:

Work in the Department of Chemistry for the year 1918 included study of the effects of peanuts, peanut meal, velvet beans, corn, and tankage upon the carcasses and fat of hogs receiving those products in various proportions in the rations.

In the study of the composition of cotton seed in breeding experiments designed to develop a strain of cotton with seed high in oil, it has been found possible to correlate the percentage of oil and ammonia with the amounts of certain inorganic constitutents present in the seed.

The Department is also correlating the physiological changes within the cotton seed with climatic conditions existing during the growth of the plant.

Early publication of results of the latter investigation is contemplated.

Respectfully submitted.

C. L. HARE,
Physiological Chemist.